# Joel Miller

Department of Epidemiology
Harvard School of Public Health
677 Huntington Ave
Boston, MA 02115

(617) 432-7207 (work) (617) 606-3978 (home)
http://cnls.lanl.gov/External/people/Joel_Miller.php
joel.c.miller.research@gmail.com

## Research Interests

**Infectious disease spread**

- Impact of social structure on growth, probability, and final size of epidemics.
- Systematic reduction of complex models of disease spread to simpler models with the same dynamics.
- Importance of the early, acute phase of infection in onwards transmission of HIV.

## Education

**Ph.D. in Applied Mathematics, University of Cambridge, 2005**

- Awarded 2006 *Vernon Harrison Prize* from the British Society of Rheology for "the most original and significant contribution to any branch of rheological research leading to the award of a PhD degree" in the UK.

**Certificate of Advanced Study in Mathematics, University of Cambridge, 2001**
**Bachelor of Science in Mathematics, Harvey Mudd College with High Distinction and Honors, 2000**

## Selected Awards

- 2008 Research and Policy for Infectious Disease Dynamics (RAPIDD) postdoctoral fellowship.
- 2008 National Science Foundation Mathematics Postdoctoral Fellowship (declined).
- 2006 Vernon Harrison Award for best UK doctoral thesis in rheology.
- 2000 Hertz graduate fellowship (one of 25 in US). http://en.wikipedia.org/wiki/Hertz_Foundation
- 2000 NDSEG, NSF, and Churchill graduate fellowships.
- 2000 Stavros Busenburg Prize in Applied Mathematics from Harvey Mudd College.

## Research and Teaching Experience

**Postdoctoral fellow, Harvard School of Public Health: 2008–present**
*Department of Epidemiology*

- Member of RAPIDD working group on model hierarchies, studying and developing models appropriate for different contexts. The working group's focus is to develop an improved understanding of the relation amongst different mathematical models of epidemics in order to improve our understanding of true epidemics.
- Co-organized the RAPIDD *Epidemics across multiple scales* meeting in June 2009.
- Organize a weekly "chalk-talk" seminar series at Harvard School of Public Health.

**Postdoctoral fellow, University of British Columbia Centre for Disease Control: 2007–2008**
*Division of Mathematical Modelling*

- Research focused on epidemic models of generic respiratory disease in heterogeneous populations.
- Also performed work on statistical methods to estimate HIV incidence and development of HIV models incorporating the impact of the highly infectious acute stage lasting about 3–6 months after infection.

**Instructor, University of British Columbia Mathematics Department: Summer 2008**

- Full responsibility for an introductory Ordinary Differential Equations course.
- Median teaching evaluation from students was 'excellent'.

**Postdoctoral fellow, Los Alamos National Laboratory: 2005–2007**

*Mathematical Modeling and Analysis Group*

- Research focused on impact of small-scale groups in social networks on how epidemics spread as well as how heterogeneity in infectiousness and susceptibility affects the outcome of an epidemic. I identified a small number of parameters which control growth rate, probability, and final size of an epidemic.
- Developed a Python package for simulating epidemics in social networks.
- Organized *epitalks*, an epidemic modeling seminar series that involved members of the EpiSimS project (epidemic modeling on city/state scale based on traffic models), the EpiCast project (epidemic modeling on national scale), and other research groups at Los Alamos involved with infectious disease.
- Co-organized Los Alamos/Arizona Days conference, a joint applied mathematics conference involving Los Alamos, Arizona State University and University of Arizona.

**Doctoral student, Cambridge University: 2001–2005**

*Dept. of Applied Mathematics and Theoretical Physics*

- Studied two previously unknown interfacial instabilities arising in visco-elastic fluid flow, and showed that the commonly accepted explanation for a third instability is false.
- Used a mix of analytic and numerical techniques. Calculations focused on solving ordinary differential equation boundary value problems (using a shooting algorithm and a Chebyshev polynomial algorithm) and relatively simple partial differential equations (using finite volume methods). The calculations were primarily done in C++ and Fortran77 with a Perl interface.

**Graduate Research Assistant, Los Alamos National Laboratory: Summer 2001, 2002, and 2004**

*Mathematical Modeling and Analysis Group*

- Studied infectious disease with targeted vaccination by simulating social networks.

**Geophysical Fluid Dynamics Fellow, Summer 2003**

*Woods Hole Oceanographic Institution*

- Studied the behavior of critical layers in an elastic jet

## Publications [estimated citation count in brackets]

Most are available at http://cnls.lanl.gov/~jomiller/publications/ or through links in this pdf file.

- Submitted. **Distribution of Vaccine/Antivirals and the "Least Spread Line" in a Stratified Population**. E Goldstein, A. Apolloni, J. Wallinga, B. Lewis, J. C. Miller, M. Macauley, S. Eubank, M. Lipsitch. [0]
- Submitted. **Early Real-time Estimation of Infectious Disease Reproduction Number**. B. Davoudi, B. Pourbohloul, J. C Miller, R. Meza, L. A. Meyers, D. J. D. Earn. [0]
- Submitted. **Use of Cumulative Incidence of Novel Influenza A/H1N1 in Foreign Travelers to Estimate Lower Bounds on Cumulative Incidence in Mexico**. M. Lipsitch, M. Lajous, J. C. Miller, E. Goldstein, T. Cohen, L. Danon, J. J. O'Hagan, J. Wallinga, S. Riley, S. Dowell, C. Reed, M. McCarron. [0]
- Accepted. **Epidemics with general generation interval distributions**. J. C. Miller, B. Davoudi, R. Meza, A C. Slim, B. Pourbohloul. *Journal of Theoretical Biology.* [0]
- In Press. **Percolation and Epidemics in clustered networks**. J. C. Miller. *Physical Review E.* [0]
- In Press. **The spread of infectious diseases through clustered populations**. J. C. Miller *Journal of the Royal Society Interface.* [2]
- 2009. **Surface wrinkling of a channelized flow**. A. C. Slim, N. J. Balmforth, R. V. Craster, and J. C. Miller. *Proceedings of the Royal Society A.* [0]
- 2008. **Bounding the size and probability of epidemics on networks**. J. C. Miller. *Journal of Applied Probability.* [2]
- 2007. **Effective vaccination strategies for realistic social networks**. J. C. Miller and J. M. Hyman. *Physica A.* [0]
- 2007. **Epidemic size and probability in populations with heterogeneous infectivity and susceptibility**. J. C. Miller. *Physical Review E.* [10]
- 2007. **Estimation of the reproduction number of Dengue fever from spatial epidemic data**. G. Chowell, P. Diaz-Dueñas, J. C. Miller, P. W. Fenimore, J. M. Hyman, and C. Castillo-Chavez. *Mathematical Biosciences.* [4]

- 2007. **Interfacial instability between sheared elastic liquids in a channel**. J. C. Miller and J. M. Rallison. *Journal of Non-Newtonian Fluid Mechanics*. [4]
- 2007. **Instability of coextruded elastic liquids at high Weissenberg number**. J. C. Miller and J. M. Rallison. *Journal of Non-Newtonian Fluid Mechanics*. [3]
- 2006. **Authority rankings from HITS, PageRank, and SALSA: Existence, uniqueness, and effect of initialization**. A. Farahat, T. LoFaro, J. C. Miller, G. Rae, and L. A. Ward. *SIAM Journal on Scientific Computation*. [15]
- 2004. **Symbolic computation of exact solutions expressible in hyperbolic and elliptic functions**. D. Baldwin, U. Goktas, W. Hereman, L. Hong, R. S. Martino, and J. C. Miller. *Journal of Symbolic Computation*. [40]
- 2003. **Rates of convergence to self-similar solutions of Burgers' equation**. J. C. Miller and A. Bernoff. *Studies in Applied Mathematics*. [5]
- 2001. **Modifications of Kleinberg's HITS Algorithm using matrix exponentiation and web log records**. J. C. Miller, G. Rae, F. Schaefer, T. LoFaro, L. A. Ward, and A. Farahat. *Proceedings of the SIGIR2001 Conference*. [50]

## Other Reports

- 2003 Elastic critical layers. J. C. Miller. Proceedings of the 2003 Program in Geophysical Fluid Dynamics.
- 1998 **Modeling the effects of an asteroid collision with Antarctica**. M. Fluett, D. Mazzonni, J. C. Miller. Written for the 1998 Mathematical Contest in Modeling. One of 12 "Outstandings" out of 478 entries. Received an additional award from SIAM and was published in 1999 *UMAP Journal*.

## Selected Presentations

**Epidemics in clustered populations**
- Modelling and Data Analysis for Infectious Disease Control Workshop: Murramarang, Australia — Mar 2009
- Los Alamos National Laboratory: Los Alamos, NM — Feb 2009
- Penn State: State College, PA — Oct 2008

**Epidemics on networks**
- China-Canada Colloquium on Modelling Infectious Diseases: Xi'an, China — Sept 2009
- University of California Merced: Merced, CA — Feb 2008
- University of Alberta: Edmonton, Canada — Dec 2007
- Pacific Institute of Mathematical Sciences: Vancouver, Canada — Dec 2007
- SIAM Conference on dynamical systems: Snowbird, UT — May 2007

**Epidemic spread in heterogeneous populations**
- Los Alamos National Laboratory: Los Alamos, NM — Oct 2007
- Harvard School of Public Health: Boston, MA — Mar 2007
- Univeristy of Texas: Austin, TX — Sep 2006

**Targeted vaccination**
- Pan-American Advanced Studies Institute: Mar del Plata, Argentina — Dec 2006
- SIAM Annual meeting: Boston, MA — Jul 2006

## Skills and Service

**Computer Languages:** Experience with Python, Perl, Matlab, C++, and Fortran77.

**Languages:** Spanish, minimal written Dutch, and a touch of mostly-forgotten Hungarian

**Peer reviewer:** Mathematical Biosciences, PLoS Computational Biology, Royal Society Interface, Complexity Journal, Physica A, Physics Letters A, Journal of Non-Newtonian Fluid Mechanics, Journal of Geographical Systems, and World Wide Web Conference.